REMARKS

Rejection of Claims 1-11, 13-15, 17-22 and 24-28 Under 35 U.S.C. 102

Claims 1-11, 13-15, 17-22 and 24-28 stand rejected under 35 U.S.C. 102 as being clearly anticipated U.S. Patent 3,338,165 to Minnick ("Minnick"), the Examiner citing only "col. 2, middle and the examples".

This ground of rejection is respectfully traversed.

At column 2, line 27 et seq., Minnick discloses the use of resin balloons "in the explosive compositions of the present invention" which are exclusively liquid or gelled nitromethane. See column 3, lines 8-10 of Minnick, wherein it is stated that "The explosive compositions of the present invention may be used in either the normally liquid or in gelled form." See also column 1, line 1 et seq. of Minnick which states that the Minnick invention relates to stable, sensitized explosive compositions comprising nitromethane and, as a sensitizer, resin balloons. Starting at column 1, line 14, Minnick states that a further aspect of his invention relates to "stable, gelled explosive compositions in the form of the explosive core for detonator cord comprising nitromethane and as sensitizer, a finely divided, air-entrapping material." The air-trapping material may include bagasse, wood flour, ground balsa, resin balloons and the like, with the resin balloons being preferred. (See column 2, line 23 through line 27.) Minnick's examples each disclose a gelled nitromethane explosive composition prepared by blending 95 parts by weight nitromethane with 5 parts by weight nitrocellulose and the sensitizer.

Nitromethane is a colorless liquid which solidifies at -29°C and boils at about 101°C. See pages 243-244 of the work "Explosives", 2nd, Revised and Extended, Edition (1981) published by Verlag Chemie, of Weinheim; Deerfield Beach, Florida; and Basel. A copy of the referred to pages plus the coversheet of that publication is attached hereto as **Exhibit A**. As disclosed by Minnick, liquid nitromethane explosive may be converted to semisolid or thickened form typically referred to as gelled form nitromethane by incorporation of a suitable gelling agent, e.g., nitrocellulose. See column 1, lines 27-32 of Minnick.

Minnick thus teaches only a liquid or gelled explosive composition including a sensitizer, which liquid or gelled composition may be used as the explosive core of a detonator cord. (See column 2, line 12 through line 23.)

Minnick does not teach or suggest the use of resin balloons or any other diluent or sensitizer with a pulverulent explosive, nor with any explosive other than liquid or gelled nitromethane.

Claims 1, 13 and 21 have been amended to define a detonating cord comprising a solid core of an explosive material obtained by mixing with a first pulverulent explosive a diluent selected from a specified group of diluents. The claims further define that the diluent is present in an amount which reduces the velocity of detonation of the detonating cord as compared to that of an otherwise identical detonating cord in which the explosive material contains no diluent. The amendments are supported by the specification as filed. For example, at page 7, lines 8-10, the explosive material is described as a "pulverulent explosive" and, at page 6, lines 10-13 and in originally filed claim 21, the claimed group of diluents is described.

Inasmuch as Minnick fails to disclose an element of the claims as amended herein, i.e., that the explosive with which the diluent is mixed is a pulverulent explosive, Minnick cannot sustain a rejection under 35 U.S.C. 102. Claims 1, 13 and 21 are believed to be patentable over Minnick.

Dependent claims 2-11, 14, 15, 17-20, 22 and 24-28 are allowable at least because they depend from allowable base claims.

Rejection of Claims 12, 16 and 23 Under 35 U.S.C. 103

Claims 12, 16 and 23 stand rejected under 35 U.S.C. 103 as being obvious over Minnick (U.S. Patent 3,338,165) in view of U.S. Patent 3,995,526 to Shannon ("Shannon").

The Examiner cites Shannon as teaching the use of PETN as the main explosive in a detonating cord and states that it would be obvious to sensitize the PETN of Shannon in the manner of Minnick, if the sensitizing of such a detonating cord were desired.

This ground of rejection is respectfully traversed.

Initially, it should be noted that there is no basis for the Examiner to assume that the introduction into the Shannon composition of resin balloons as taught in Minnick would sensitize the PETN core of the Shannon detonating cord. Resin balloons are widely used as sensitizers in liquid or gelled explosive systems[2] and Minnick teaches the use of resin balloons to sensitize liquid or gelled nitromethane, but does not teach or suggest that resin balloons would also sensitize a dry explosive material, e.g., PETN. In fact, as discussed below, the Applicants have found that phenolic resin microballoons at least do not appear to sensitize PETN. Therefore, it would not be obvious to one of ordinary skill in the art to utilize the microballoons of Minnick to sensitize the PETN

core of the detonating cord taught in Shannon. At page 14, lines 18-22 of Applicants' specification, the characteristic of glass microballoons to sensitize dry explosives is noted and the utilization of glass microballoons in blasting agents is acknowledged. The latter statement is simply a reiteration of the discussion at page 2, line 29 et seq. of Applicants' specification (see footnote 2) concerning use of microballoons in liquid or gelled compositions such as ammonium nitrate-fuel oil (ANFO) compositions. It should be noted that the term "blasting agent" has an art-recognized meaning which excludes cap-sensitive explosives.[3] See **Exhibit B** attached hereto, which is a copy of pages 42-43 of the same work *Explosives*, from which **Exhibit A** is taken. There is no suggestion in the art combination relied upon by the Examiner to sensitize the detonating cord of Shannon. Minnick teaches a variety of sensitizers useful for a liquid or gelled nitromethane but that does not mean that they would sensitize PETN. As to at least resin balloons, page 14, lines 20-22 of Applicants' specification notes that the addition of phenolic microballoons to the explosive core (of a detonating cord) "does not appear to sensitize dry PETN." Therefore, not only is there not a suggestion in the art relied upon by the Examiner to sensitize the detonating cord of Shannon, but the utilization of at least the resin microballoons would fail to do so.

Further, and more fundamentally, there is no suggestion in the art relied upon by the Examiner, or in any other art of which the Applicants are aware, that the addition of the Minnick sensitizer would reduce the velocity of detonation of the Shannon detonating cord. Still further, there is no incentive to the skilled person reading the relied-upon references to want to reduce the velocity of detonation of detonating cord by adding any diluent to it. Generally, higher energy outputs are desired per unit volume of explosive expended as a matter of self-evident economics. The Applicants alone have recognized that in particular cases a reduced velocity of detonation is desirable, particularly in quarrying and the dimension stone industry, and further that addition of the defined diluents will attain a reduction in velocity of detonation, thereby reducing undesired radial cracking and spalling of the cut stone. Prior to that recognition by the Applicants, the art would be disinclined to do anything to a detonating cord that would reduce its velocity of detonation. As discussed at page 12, line 24 et seq. of Applicants' specification, and as shown by the experimental

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[2] For example, see page 2, line 29 et seq. of Applicants' specification wherein the prior use of glass microballoons as sensitizing agents in emulsion explosives and the like is acknowledged, with reference to U.S. Patent 6,165,297 and 6,200,398 and other art referred to in the paragraph bridging pages 2 and 3 of Applicants' specification.

[3] Each of PETN, HMX, HNS, TNC, PYX and RDX is a cap-sensitive explosive. See page 2, lines 21-22, page 3, lines 10-17 and page 5, lines 32-33 of Applicants' specification for a definition of these well-known acronyms for explosives.

data plotted in Figures 7-12 of the specification, the reduced-velocity-of-detonation detonating cord of the present invention reduces the high-amplitude, sharp peaks while nonetheless maintaining much of pressure that occurs generally throughout the pressure profile. As explained starting at page 12, line 32 of Applicants' specification, maintaining the overall level of the pressure profile avoids reducing the total energy output while reducing shock wave pressure peaks, thereby reducing radial fracturing.

Another disincentive to the introduction of diluents in the form of microballoons into the Shannon composition is that it is conventional in the manufacture of detonating cord to compress the finished, sheathed cord through compacting dies in order to densify the core and provide a uniform density and diameter to the cord. For example, see column 1, lines 23-32 of Shannon which refers to consolidating the detonating cord being manufactured "by passing the tube through compacting dies". As described starting at page 16, line 17 of Applicants' specification, this post-production or end-of-production compressing diminishes the amount of reduction in velocity of detonation desired by the Applicants (but generally not by the art) when microballoons are utilized as the diluent. This is because of crushing of the microballoons. This fact provides yet another disincentive for the skilled practitioner to incorporate the resin (or other) microballoons of Minnick into the conventional manufacture of PETN solid core detonating cord taught by Shannon. The microballoons would be crushed, thereby attenuating their effectiveness as density reducers.

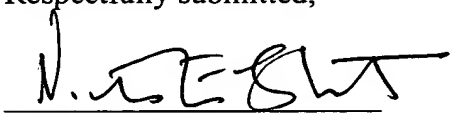
The combination of Minnick and Shannon appears to be an improper combination based upon proscribed "hindsight" reasoning for at least the following reasons. First, there is no basis for the Examiner to assume that incorporation of the microballoons taught by Minnick for use in a liquid or gelled explosive would have a sensitizing effect in the dry detonating cord of Shannon. (As noted above, Applicants' work indicates that it would not.) Secondly, Shannon's teaching of compression of the detonating cord would be a disincentive to utilize microballoons as they would be crushed during the compression process as Applicants' work, reported at page 15, lines 17 et seq. of Applicants' specification, shows. Last, but not least, the Applicants' objective of reducing the velocity of detonation of the cord is not even remotely contemplated by either of the relied-upon references. It therefore seems clear that the combination of Minnick, which is exclusively concerned with a liquid or gelled explosive, and Shannon, which is concerned with a compressed pulverulent explosive, is suggested not by anything in the references themselves or in the general knowledge of

the prior art, but solely by Applicants' disclosure. It is settled law that such an improper combination of references cannot validly sustain a rejection under 35 U.S.C. 103.

Conclusion

In view of the foregoing amendments and remarks, the Applicants respectfully request reconsideration and withdrawal of the rejection, and allowance of each of claims 1-28.

Respectfully submitted,



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